Material Studies Status

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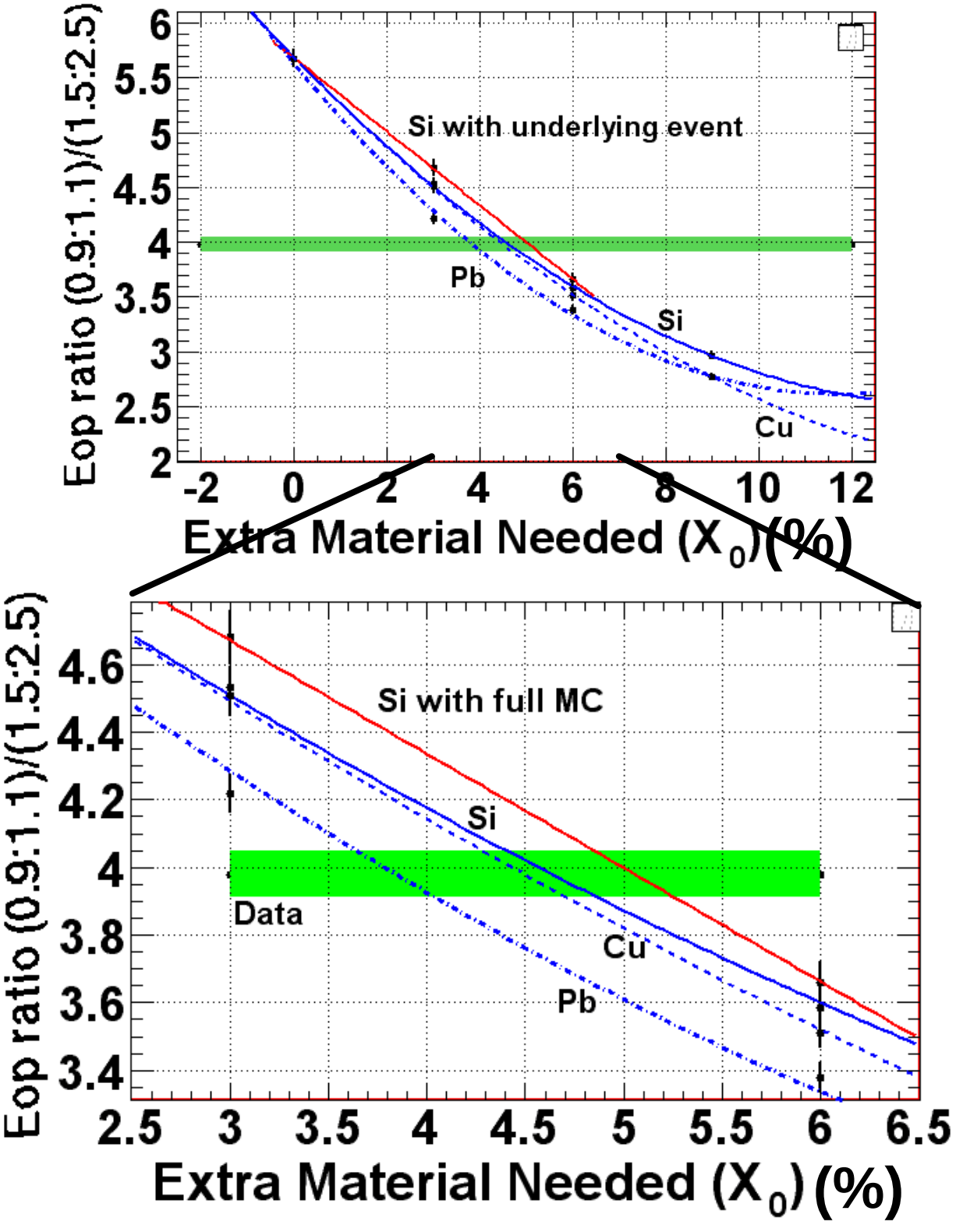
- Simulated large sample Drell-Yan
  - With 4.6% X_0 Cu instead of Si layer
  - Crosschecked with (Si) →5.5% X_0!
- Need many samples with different materials
  - Carbon, Silicon, Copper, and Lead
  - 3%, 6%, and 9% X_0 each
  - 500k events per sample
  - Need 5.5M events → need *fast simulation*
- Getting fast simulation
  - Only need e's and γ's
    - No jet fragmentation (**MSTJ(1)=0**)
  - Turn off silicon hit simulation
    - **simulateSvx set f**
  - **13s / event → 0.7s / event**
  - **170 kb / event → 12 kb / event**

Numbers

- Looking at E/P ratio (0.9:1.1)/(1.5:2.5)
  - No Layer (full MC) : $5.68 \pm 0.08\%\ X_0$
  - No Layer (fast MC) : $5.71 \pm 0.05\%\ X_0$

	+3%X_0	**+6%X_0**	**+9%X_0**
Carbon (fast)	4.54 ± 0.06		
Si (full MC)	4.68 ± 0.08	3.66 ± 0.06	
Si (fast MC)	4.53 ± 0.06	3.59 ± 0.05	2.97 ± 0.04
Cu (fast MC)	4.51 ± 0.06	3.51 ± 0.05	2.77 ± 0.04
Pb (fast MC)	4.22 ± 0.06	3.38 ± 0.05	2.77 ± 0.04

Plots


Eop ratio (0.9:1.1)/(1.5:2.5)
Si with underlying event
Pb
Si
Cu
Extra Material Needed (X_0) (%)
Si with full MC
Si
Data
Cu
Pb
Eop ratio (0.9:1.1)/(1.5:2.5)
Extra Material Needed (X_0) (%)

What next…

- Type of material dependence
  - Approx. cross section for high E brems.

$$\frac{ds}{dk} = \frac{A}{X_0 N_A k}\left(\frac{4}{3} - \frac{4}{3}y + y^2\right)$$

  - k: energy of photon
  - y= k/E
  - A: atomic number

- So E/P is sensitive to X_0 and type of material
  - Good news: need fewer X_0 of copper
    - Will agree better with dE/dx
  - Estimate: $4.5\% \pm 1.5\%$ X_0 of Cu
  - A. Korn (dE/dx):
    - $.25 \pm 0.1$ cm Si $\approx 5.4\% \pm 3.1\%$ X_0 Cu